XC800 Family

AP08104

Guide to using the DALI LightNet tool

Application Note

V1.1, 2011-02

Microcontrollers

Edition 2011-02

Published by
Infineon Technologies AG
81726 Munich, Germany

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XC82x, XC83x
Revision History: V1.1 2011-02

Previous Version(s): V1.0

Page	Subjects (major changes since last revision)
–	Removed XC800 USB support. Added information for configuring XC836 Easy Kit into a DALI Control Device is added.

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1 Overview

Digital Addressable Lighting Interface (DALI) is a communication protocol for lighting control in buildings. The interface was first described in the IEC60929 standard for fluorescent lamp ballast, Annex E. The standard was subsequently updated to include other lighting devices, such as LED, HID, etc., to become IEC-62386. The complete standard for control interface of electronic control gears was published in June 2009, while the standard for lighting control devices is scheduled to be published in 2012.

Only a pair of wires are required to form the bus for communication to all devices on a single DALI network. Each piece of operating equiment with a DALI interface can be communicated with individually. Using a bi-directional data exchange, a DALI controller can query and set the status of each connected lighting device. As a standalone system, DALI can be operated with a maximum of 64 devices. Alternatively, DALI can be used as a subsystem via DALI gateways for connection to building management systems.

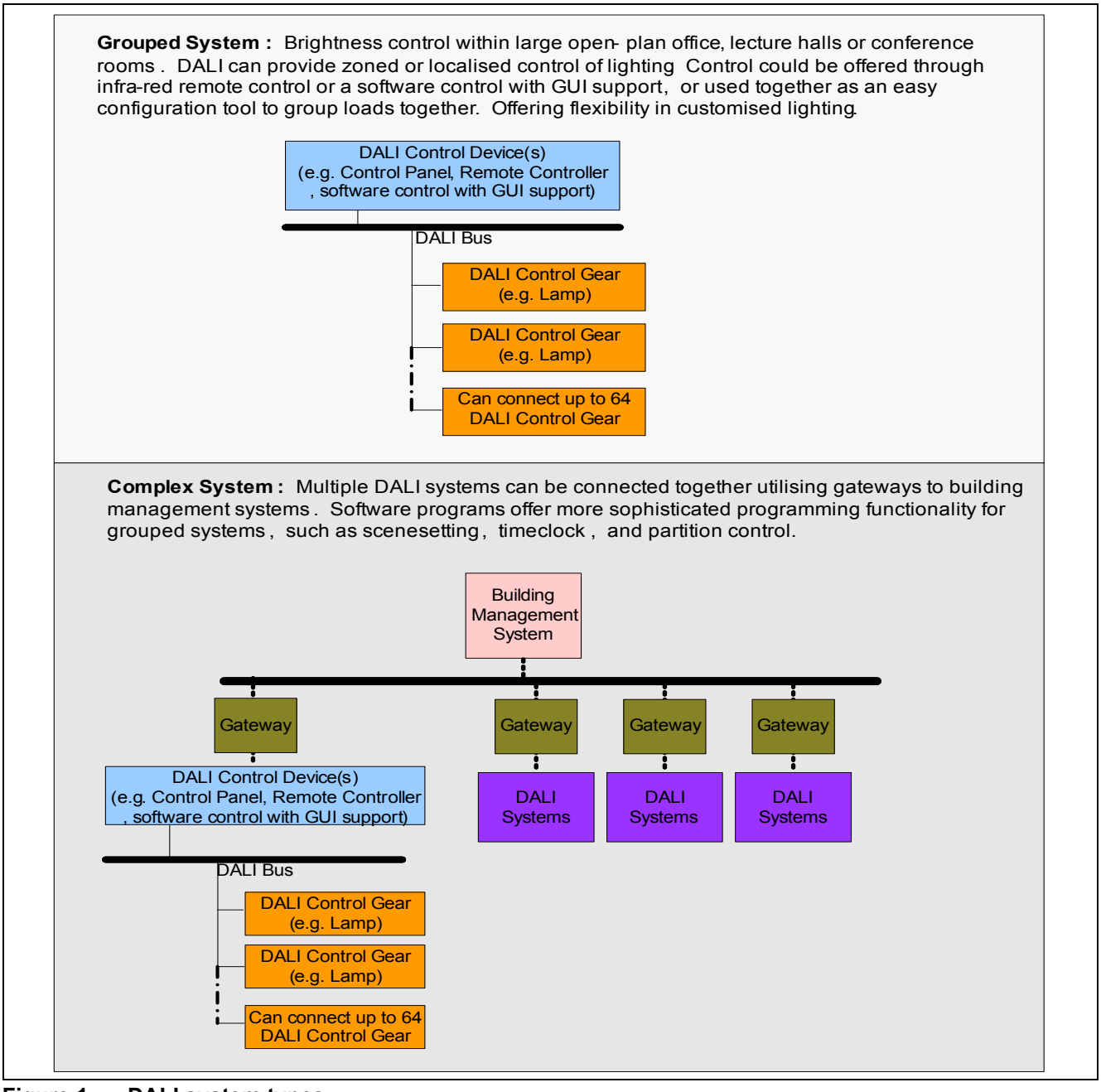
Grouped System : Brightness control within large open- plan office, lecture halls or conference rooms . DALI can provide zoned or localised control of lighting Control could be offered through infra-red remote control or a software control with GUI support, or used together as an easy configuration tool to group loads together. Offering flexibility in customised lighting.
DALI Control Device(s) (e.g. Control Panel, Remote Controller , software control with GUI support)
DALI Bus
DALI Control Gear (e.g. Lamp)
DALI Control Gear (e.g. Lamp)
Can connect up to 64 DALI Control Gear
Complex System : Multiple DALI systems can be connected together utilising gateways to building management systems . Software programs offer more sophisticated programming functionality for grouped systems , such as scenesetting , timeclock , and partition control.
Building Management System
Gateway
Gateway
Gateway
Gateway
DALI Control Device(s) (e.g. Control Panel, Remote Controller , software control with GUI support)
DALI Systems
DALI Systems
DALI Systems
DALI Bus
DALI Control Gear (e.g. Lamp)
DALI Control Gear (e.g. Lamp)
Can connect up to 64 DALI Control Gear

Figure 1 DALI system types

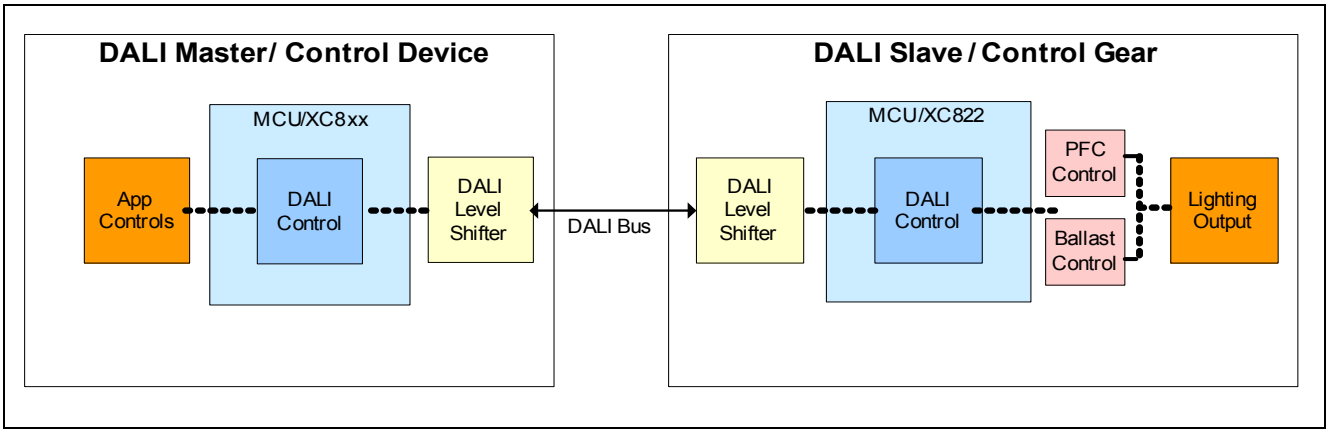

Figure 2 Block Diagram for DALI Control Device and Control Gear

Infineon has developed a solution for control gears based on the published IEC standard. The DALI Software Stack for Control Gear has been designed around the Infineon XC82x devices. 'LightNet' has been created to mimic the basic functions of a lighting control device and can therefore be used to evaluate the software. This document describes the setup of the LightNet tool.

The following items are required for use with this application note:

- 1x XC836 Easy Kit (to serve as a DALI Control Device)
- 1x XC822 Easy Kit including DALI Control Gear Software Stack (AP08102)
- Infineon DALI LightNet tool

2 Getting started

This section guides the users through the installation process.

2.1 LightNet Software

The LightNet software is designed to provide the control device the facility to send basic DALI commands to the connected control gear. Installation is only to be performed once, using the file: LightNet_setup_V1_1.exe.

The following figures step through the LightNet tool installation process.

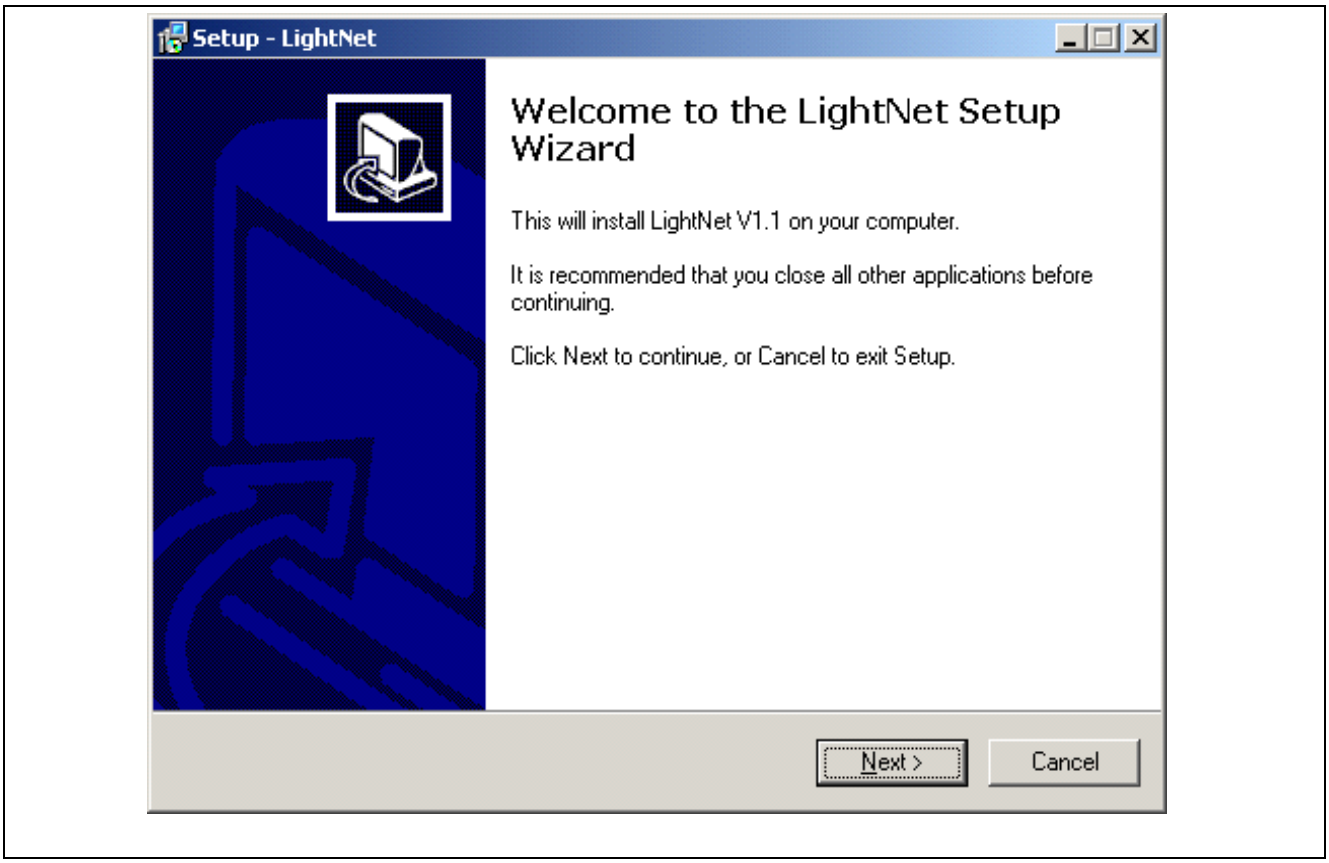
Setup - LightNet
Welcome to the LightNet Setup Wizard
This will install LightNet V1.1 on your computer.
It is recommended that you close all other applications before continuing.
Click Next to continue, or Cancel to exit Setup.
Next >
Cancel

Figure 3 LightNet tool installation window

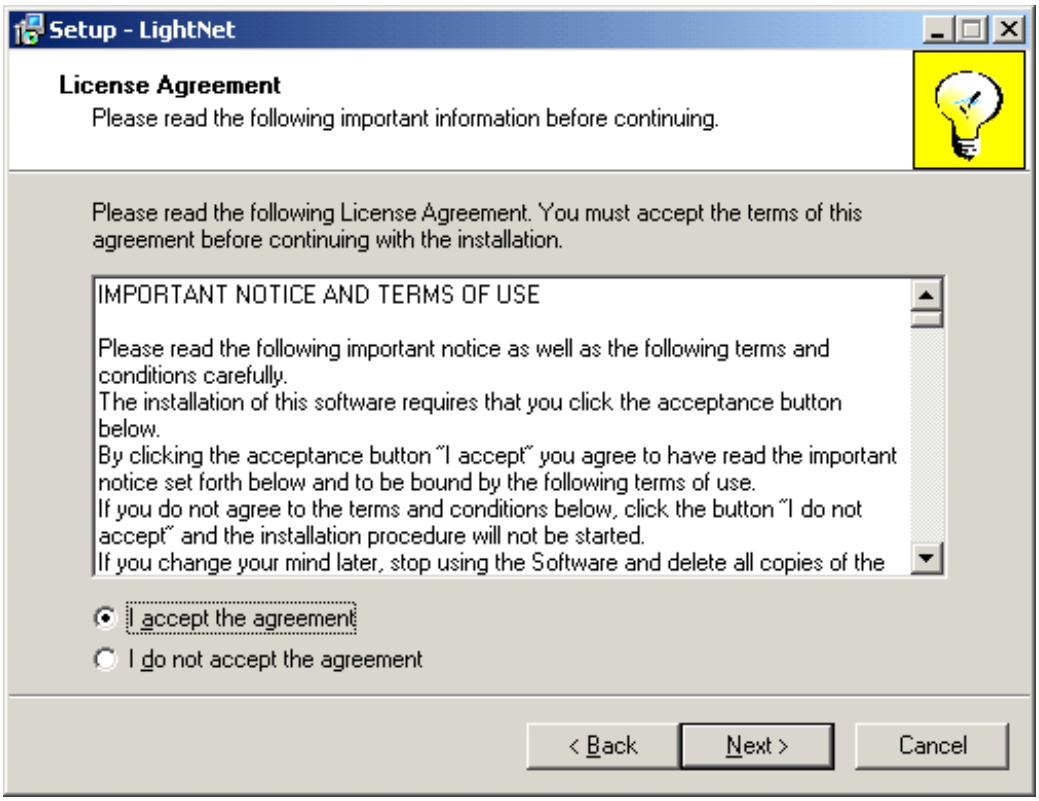
Setup - LightNet
License Agreement
Please read the following important information before continuing.
Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.
IMPORTANT NOTICE AND TERMS OF USE
Please read the following important notice as well as the following terms and conditions carefully.
The installation of this software requires that you click the acceptance button below.
By clicking the acceptance button "I accept" you agree to have read the important notice set forth below and to be bound by the following terms of use.
If you do not agree to the terms and conditions below, click the button "I do not accept" and the installation procedure will not be started.
If you change your mind later, stop using the Software and delete all copies of the
I accept the agreement
I do not accept the agreement
< Back
Next >
Cancel

Figure 4 LightNet tool license agreement

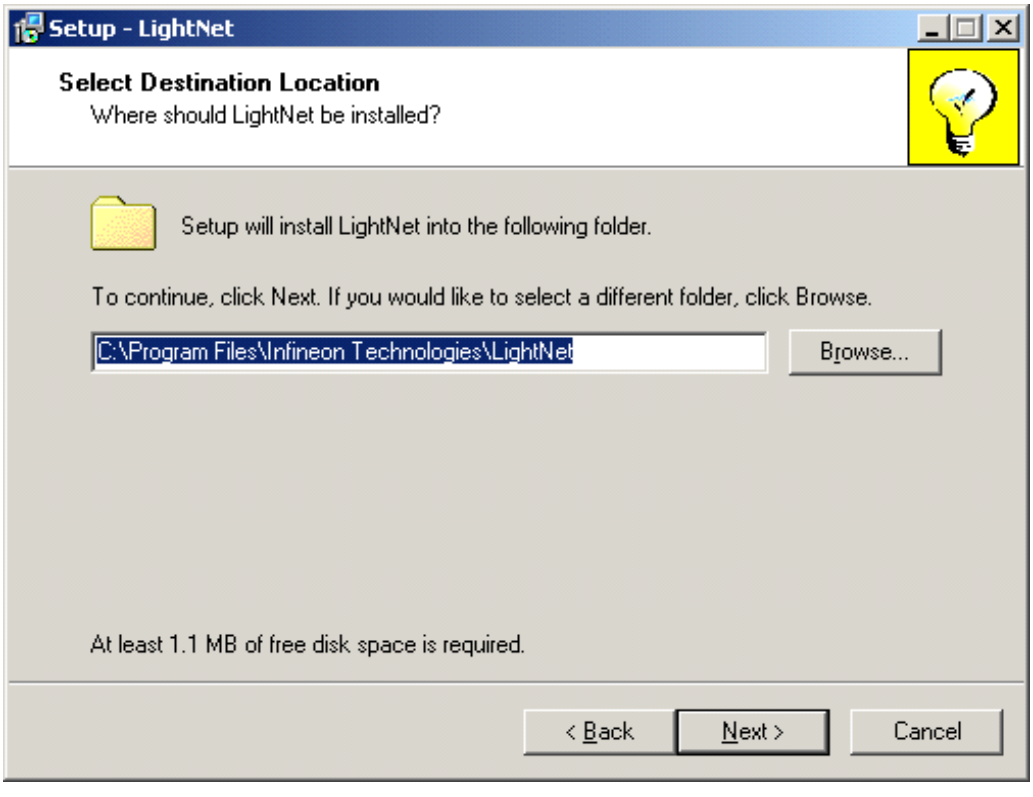
Setup - LightNet
Select Destination Location
Where should LightNet be installed?
Setup will install LightNet into the following folder.
To continue, click Next. If you would like to select a different folder, click Browse.
C:\Program Files\Infineon Technologies\LightNet
Browse...
At least 1.1 MB of free disk space is required.
< Back
Next >
Cancel

Figure 5 LightNet tool destination location selection

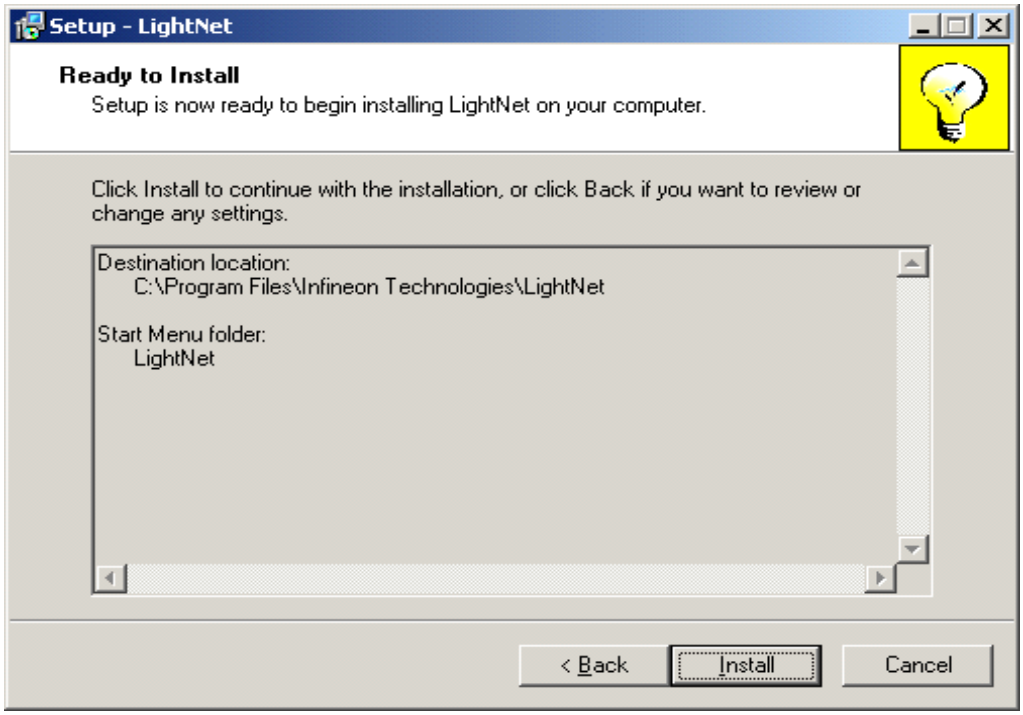
Setup - LightNet
Ready to Install
Setup is now ready to begin installing LightNet on your computer.
Click Install to continue with the installation, or click Back if you want to review or change any settings.
Destination location:
C:\Program Files\Infineon Technologies\LightNet
Start Menu folder:
LightNet
< Back
Install
Cancel

Figure 6 LightNet tool installation start

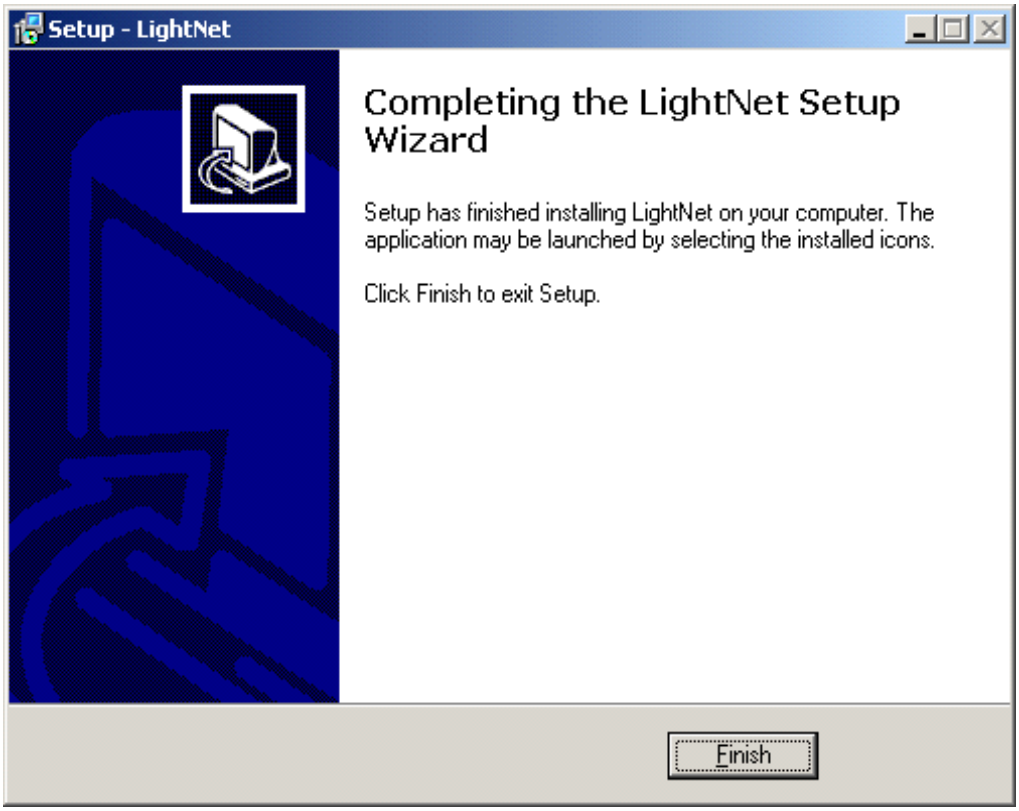
Setup - LightNet
Completing the LightNet Setup Wizard
Setup has finished installing LightNet on your computer. The application may be launched by selecting the installed icons.
Click Finish to exit Setup.
Finish

Figure 7 LightNet tool setup completed

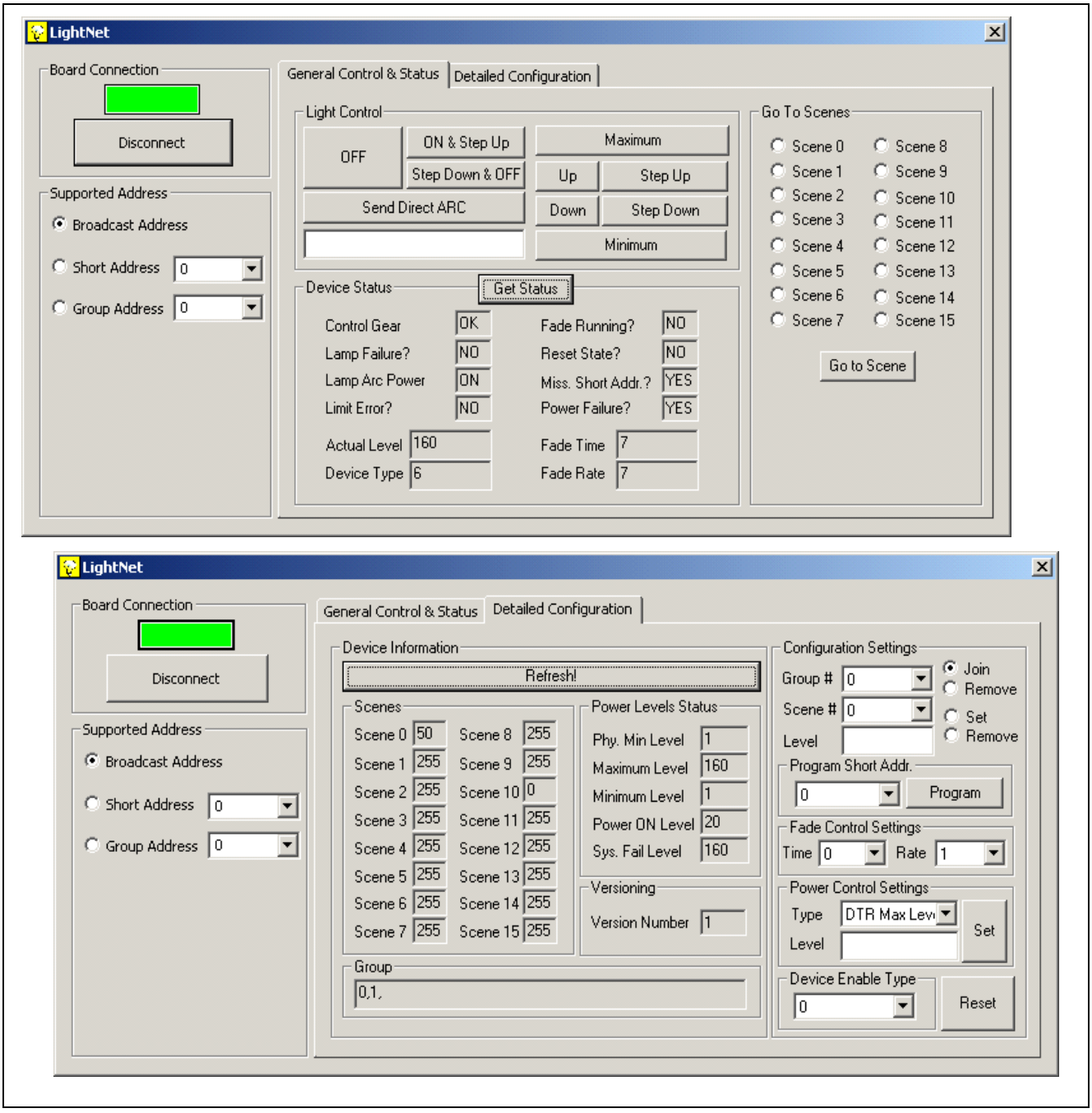

Figure 8 Screenshots of LightNet tool

2.2 DALI Control Device Software

The DALI Software for Control Device has been developed to support the use of the LightNet tool and can work on XC836 Easy Kit boards. This software must be downloaded to the XC836 Easy Kit board prior to calling the LightNet tool. (File: AP0810410_LightNet_XC800Master_code.exe)

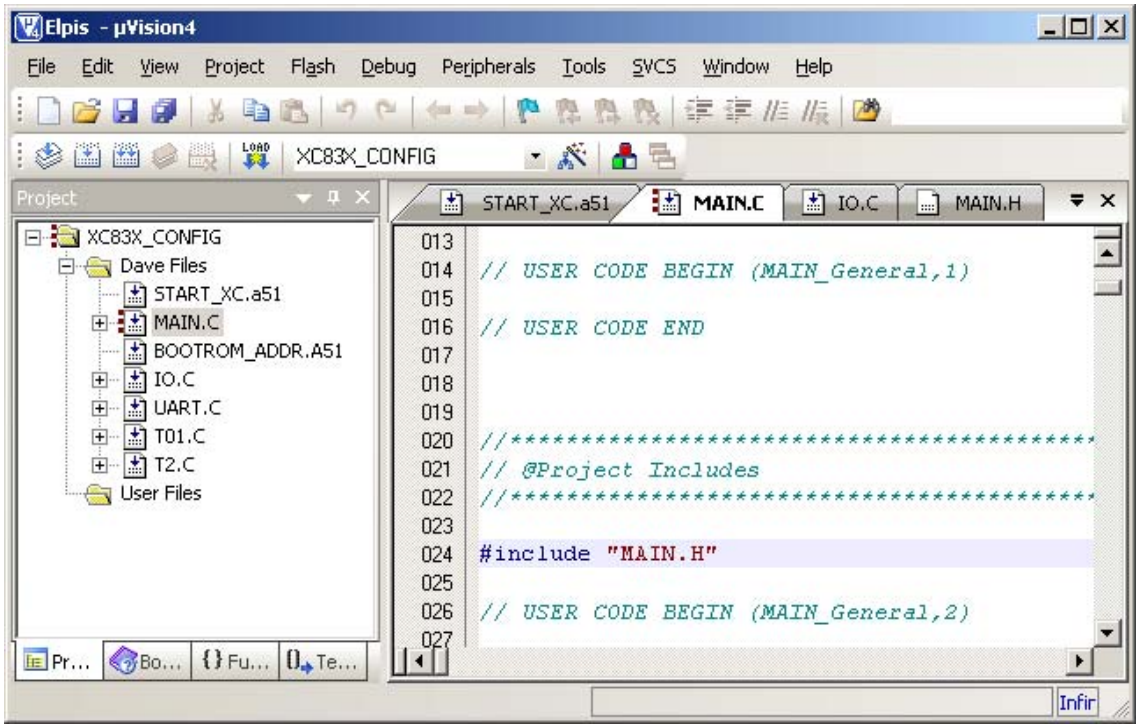

Figure 9 Screenshots of DALI Control Device Project Window

2.3 DALI Control Gear Software

The DALI Software for Control Gear has been developed on the XC82x to support the features specified in the International Standard IEC-62386 / Part 102 for control gears. This software includes application code for an LED module, supplied with the XC822 Easy Kit. Through a control device, the LightNet software allows DALI commands to be issued to control the brightness of the LED module attached to the control gear. This software must be downloaded to the XC822 Easy Kit. For further details, please refer to *AP08102 DALI Control Gear Software Stack*.

2.4 Hardware Setup

The LightNet tool acts as the software for the DALI Control Device, and can be used with either the XC822 or XC836 Easy Kit.

The following sections describe how to setup the LightNet tool to evaluate the DALI protocol at the Microcontroller level.

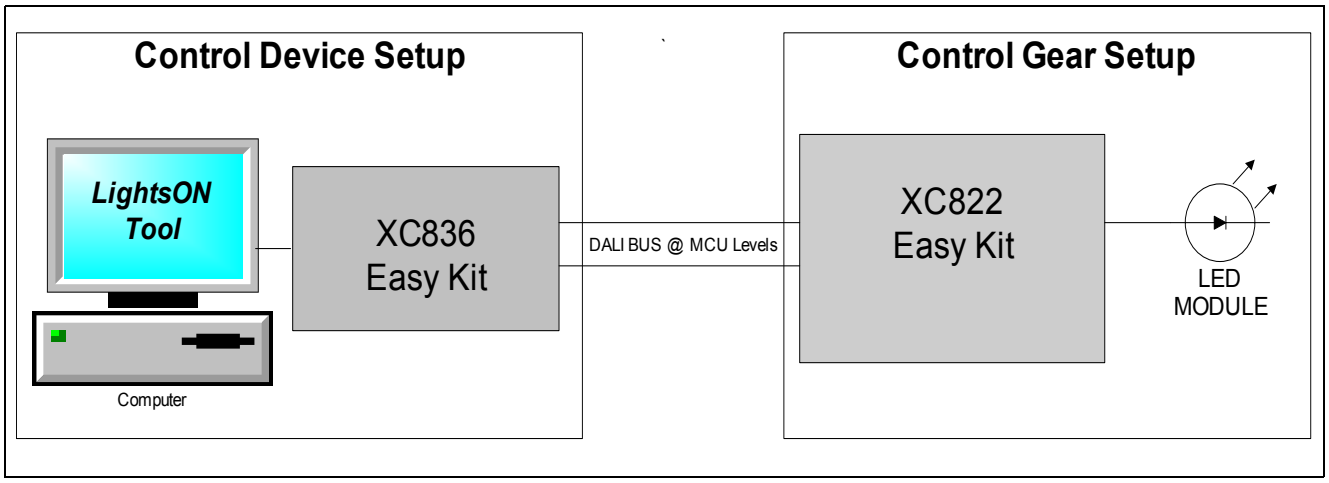

Figure 10 Hardware Setup Block Diagram for Control Device and Control Gear

2.4.1 Setting up the Control Gear

For the DALI Control Gear setup using the XC822 Easy Kit, connect the LED module and enable the boost converter by connecting the BC_EN jumper as shown below. Also, using XC800 FLOAD, change the XC822 Easy Kit Boot Mode to User Mode (Diagnostic) with SPD pin SPD_0.

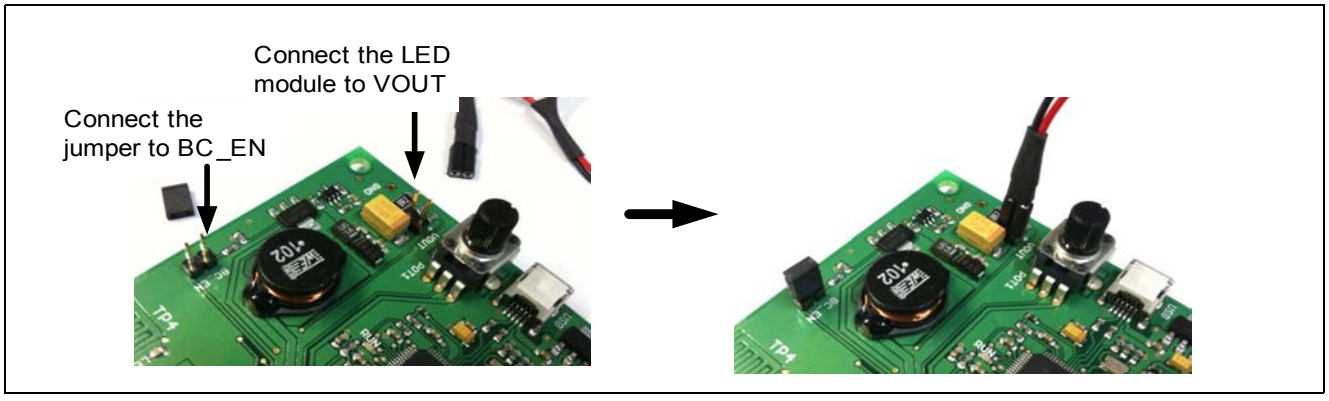

Figure 11 Connecting the LED module and boost converter jumper

2.4.2 Setting up the Control Device for LightNet

The XC836 Easy Kit board can be used as the LightNet DALI Control Device, with the following steps:

1. Modify the XC836 Easy Kit board.

2. Connect and download the generated hexfile (File:Elpis.hex) from **Section 2.2** into the XC836 Easy Kit board using XC800 FLOAD.

3. Using XC800 FLOAD, change the XC836 Easy Kit Boot Mode to UART BSL Mode, then configure the COM_SEL jumper to support UART BSL mode.

Note: To ensure the success of the following procedures, please ensure that the device has been successfully configured to UART BSL mode .

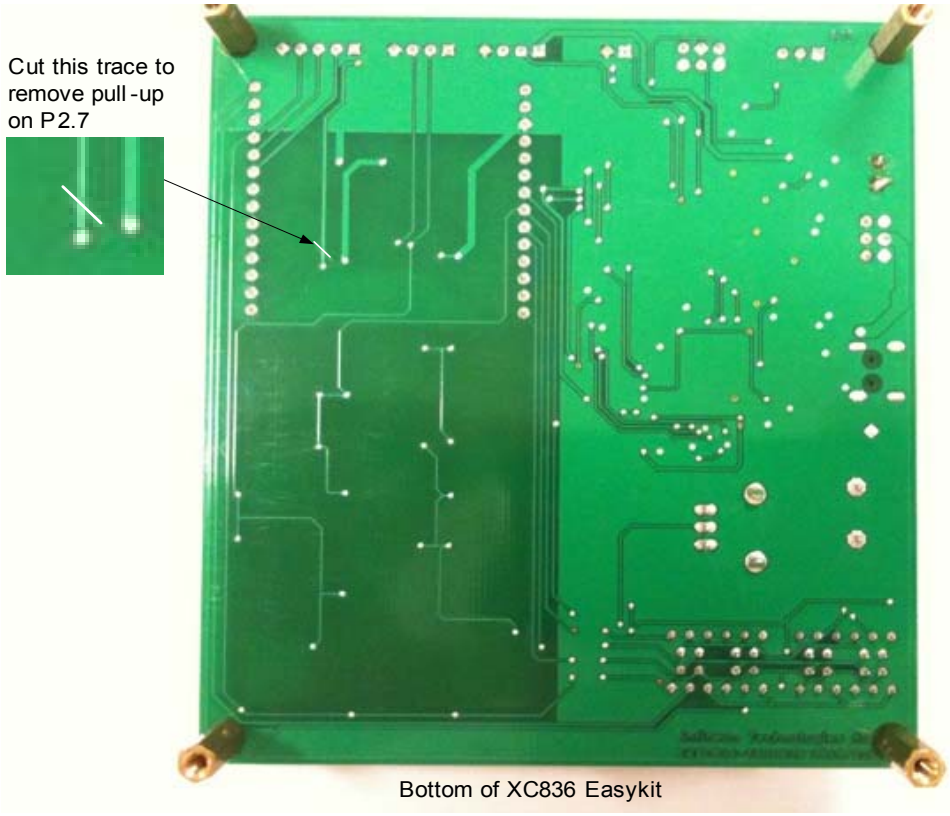

Figure 12 XC836 Easy Kit Modification: Remove connection by cutting trace

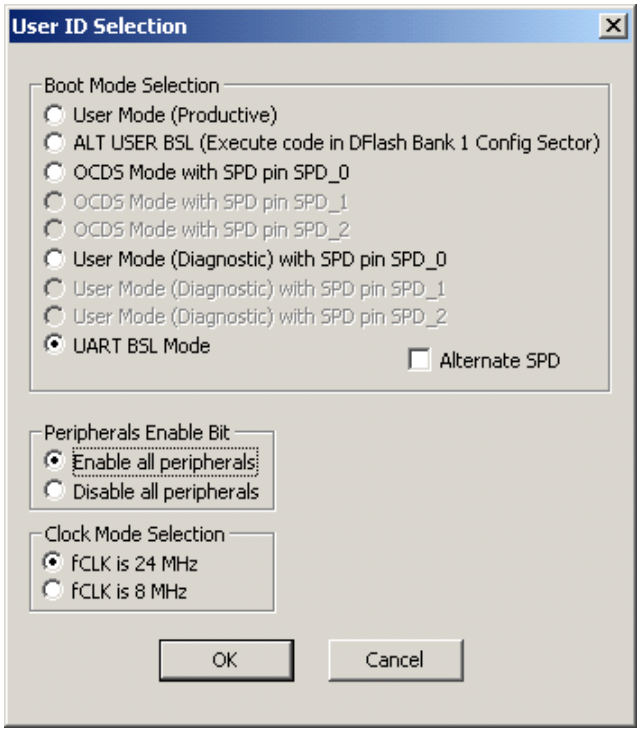
User ID Selection
Boot Mode Selection
User Mode (Productive)
ALT USER BSL (Execute code in DFlash Bank 1 Config Sector)
OCDS Mode with SPD pin SPD_0
OCDS Mode with SPD pin SPD_1
OCDS Mode with SPD pin SPD_2
User Mode (Diagnostic) with SPD pin SPD_0
User Mode (Diagnostic) with SPD pin SPD_1
User Mode (Diagnostic) with SPD pin SPD_2
UART BSL Mode
Alternate SPD
Peripherals Enable Bit
Enable all peripherals
Disable all peripherals
Clock Mode Selection
fCLK is 24 MHz
fCLK is 8 MHz
OK
Cancel

Figure 13 Boot Mode Selection

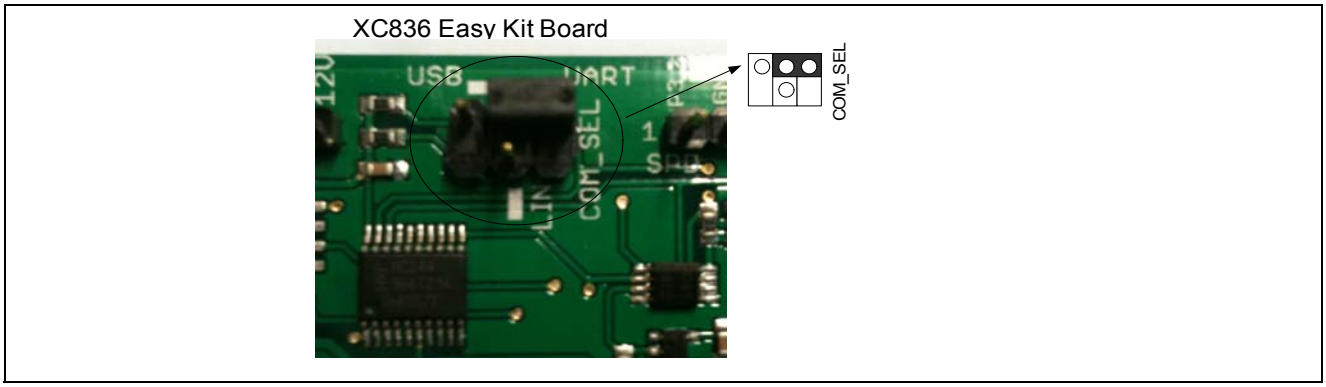

Figure 14 Configure Jumper Settings for UART BSL Mode

3. Connect the selected DALI Control Device and XC822 Easy Kit to the host PC.

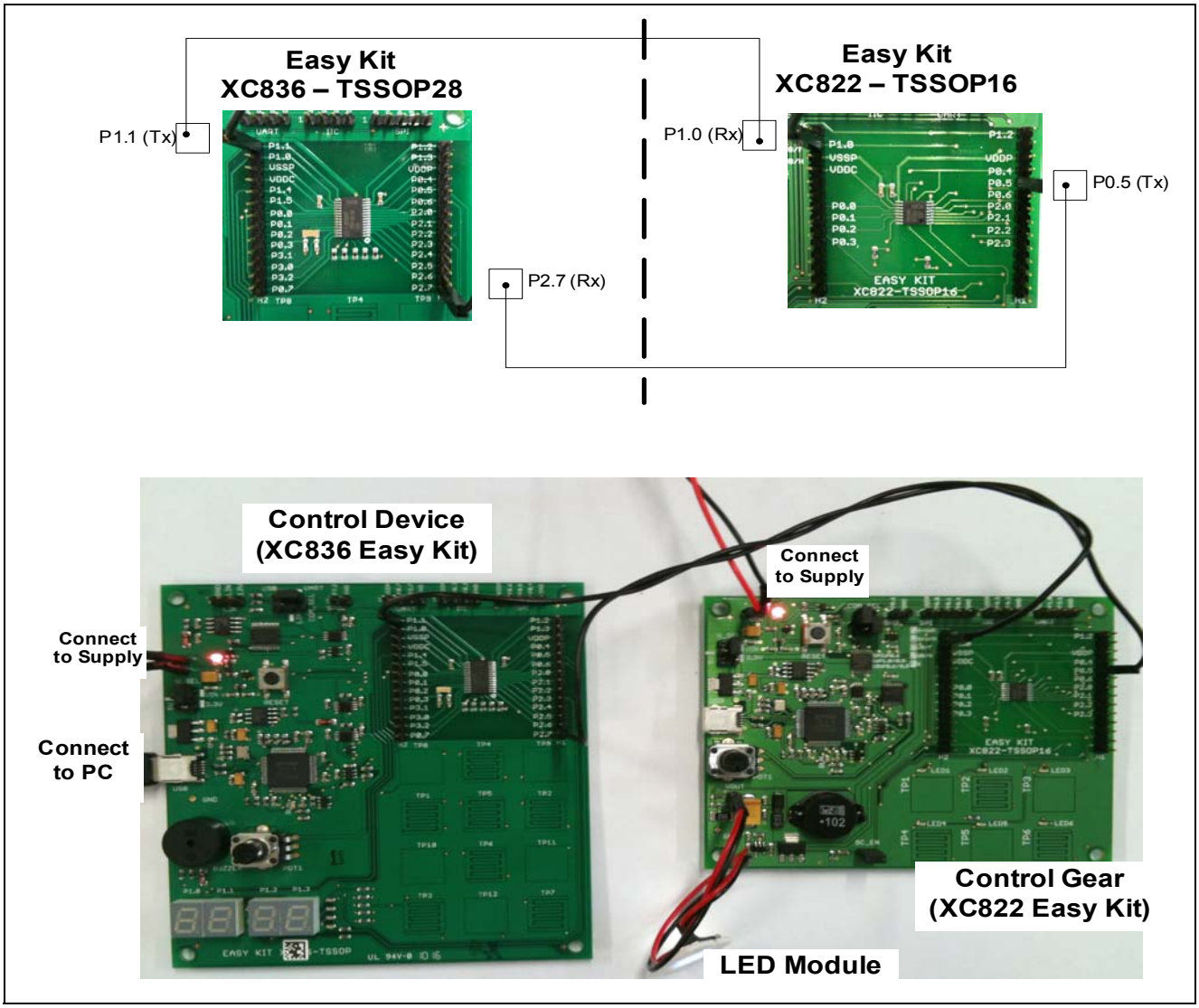

Figure 15 Connection for DALI Control Device (XC836 Easy Kit) and DALI Control Gear (XC822 Easy Kit)

4. Reset the Control Device (Easy Kit). This must always be done before the LightNet is started.

5. Click on the Connect button and start using the LightNet software for your DALI evaluation.

3 LightNet Tool

This chapter describes how the LightNet software is organised.

3.1 Connecting the LightNet tool

Once the recommended hardware setup has been completed, LightNet can be used. **Figure 16** shows how to connect to the LightNet tool.

Note: The LightNet tool cannot be activated if the recommended setup has not been completed as described; i.e. the XC836 Easy Kit is not connected, or the BMI is incorrectly selected.

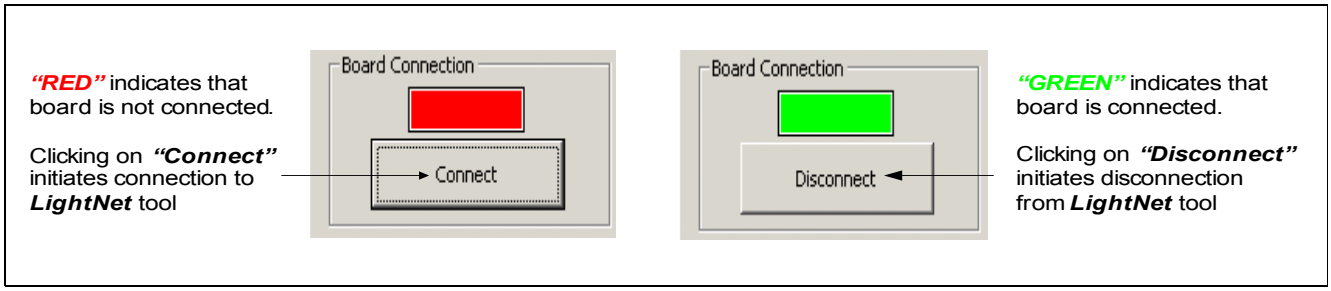
"RED" indicates that board is not connected.
Clicking on "Connect" initiates connection to LightNet tool
Board Connection
Connect
Board Connection
Disconnect
"GREEN" indicates that board is connected.
Clicking on "Disconnect" initiates disconnection from LightNet tool

Figure 16 Connecting the Board

3.2 Address Selection

LightNet supports 3 types of DALI addressing:

- Broadcast
- Short Address
- Group Address

The user decides the type of addressing to be sent with each command by selecting from the available options.

For Group Address, the user is required to add the group address to the detailed configuration settings tab, as shown in **Chapter 3.4**.

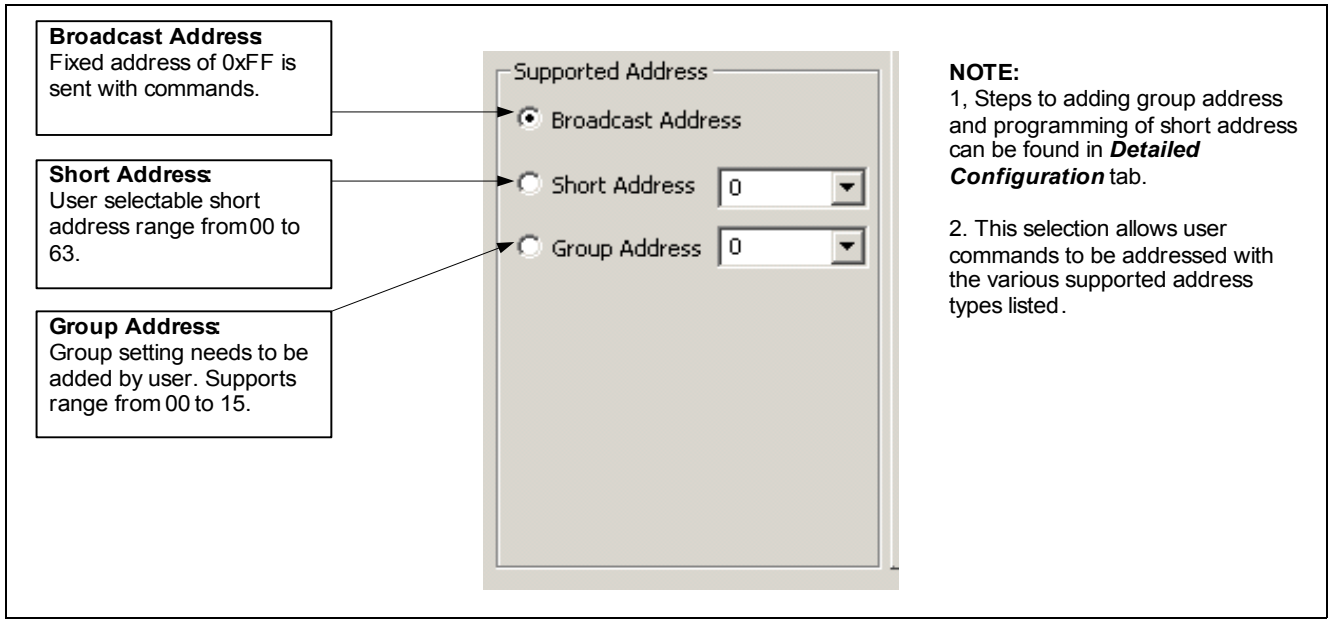
Broadcast Address
Fixed address of 0xFF is sent with commands.
Short Address:
User selectable short address range from 00 to 63.
Group Address:
Group setting needs to be added by user. Supports range from 00 to 15.
Supported Address
Broadcast Address
Short Address
0
Group Address
0
NOTE:
1, Steps to adding group address and programming of short address can be found in Detailed Configuration tab.
2. This selection allows user commands to be addressed with the various supported address types listed.

Figure 17 Address Selection

3.3 General Control & Status Tab

This section describes the general device control and status functions.

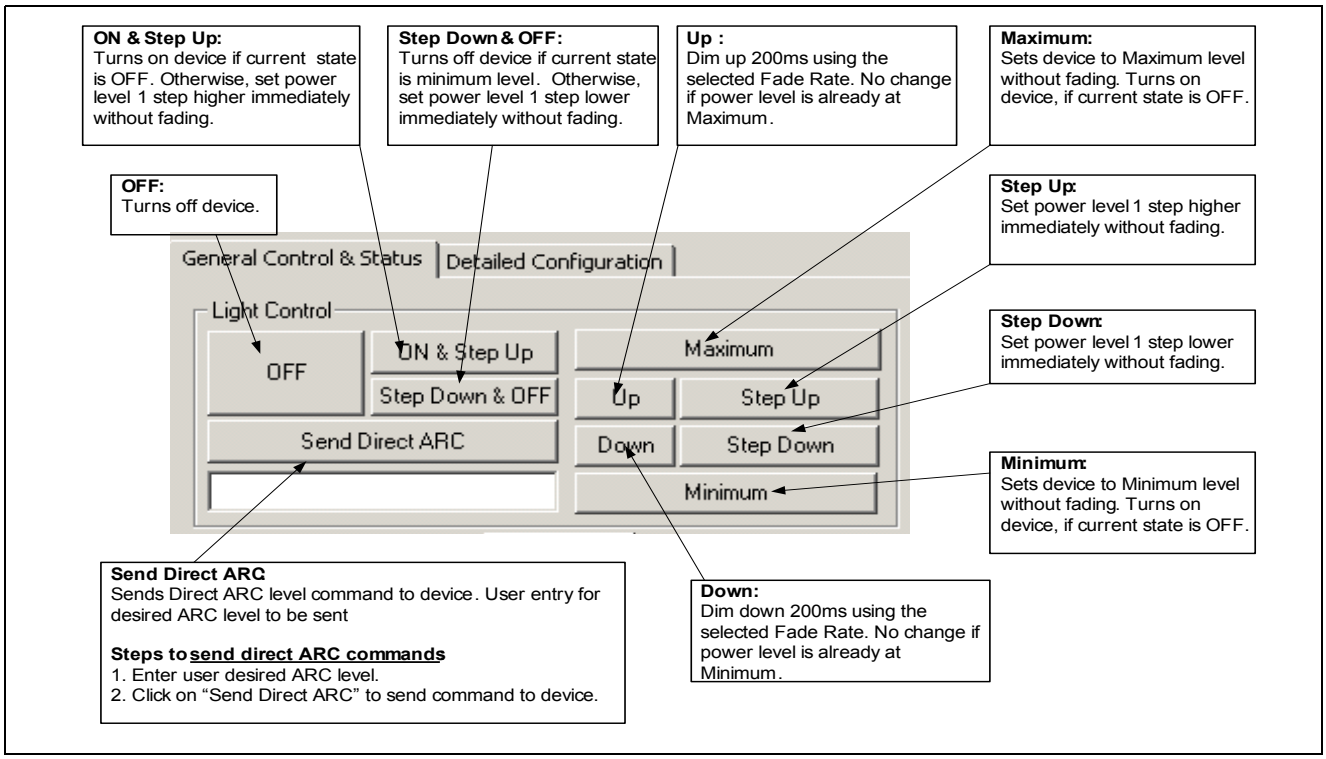
ON & Step Up:
Turns on device if current state is OFF. Otherwise, set power level 1 step higher immediately without fading.
Step Down & OFF:
Turns off device if current state is minimum level. Otherwise, set power level 1 step lower immediately without fading.
Up :
Dim up 200ms using the selected Fade Rate. No change if power level is already at Maximum.
Maximum:
Sets device to Maximum level without fading. Turns on device, if current state is OFF.
OFF:
Turns off device.
Step Up:
Set power level 1 step higher immediately without fading.
Step Down:
Set power level 1 step lower immediately without fading.
Minimum:
Sets device to Minimum level without fading. Turns on device, if current state is OFF.
General Control & Status
Detailed Configuration
Light Control
OFF
ON & Step Up
Step Down & OFF
Maximum
Up
Step Up
Down
Step Down
Minimum
Send Direct ARC
Send Direct ARC:
Sends Direct ARC level command to device. User entry for desired ARC level to be sent
Steps to send direct ARC commands
1. Enter user desired ARC level.
2. Click on "Send Direct ARC" to send command to device.
Down:
Dim down 200ms using the selected Fade Rate. No change if power level is already at Minimum.

Figure 18 Light Control

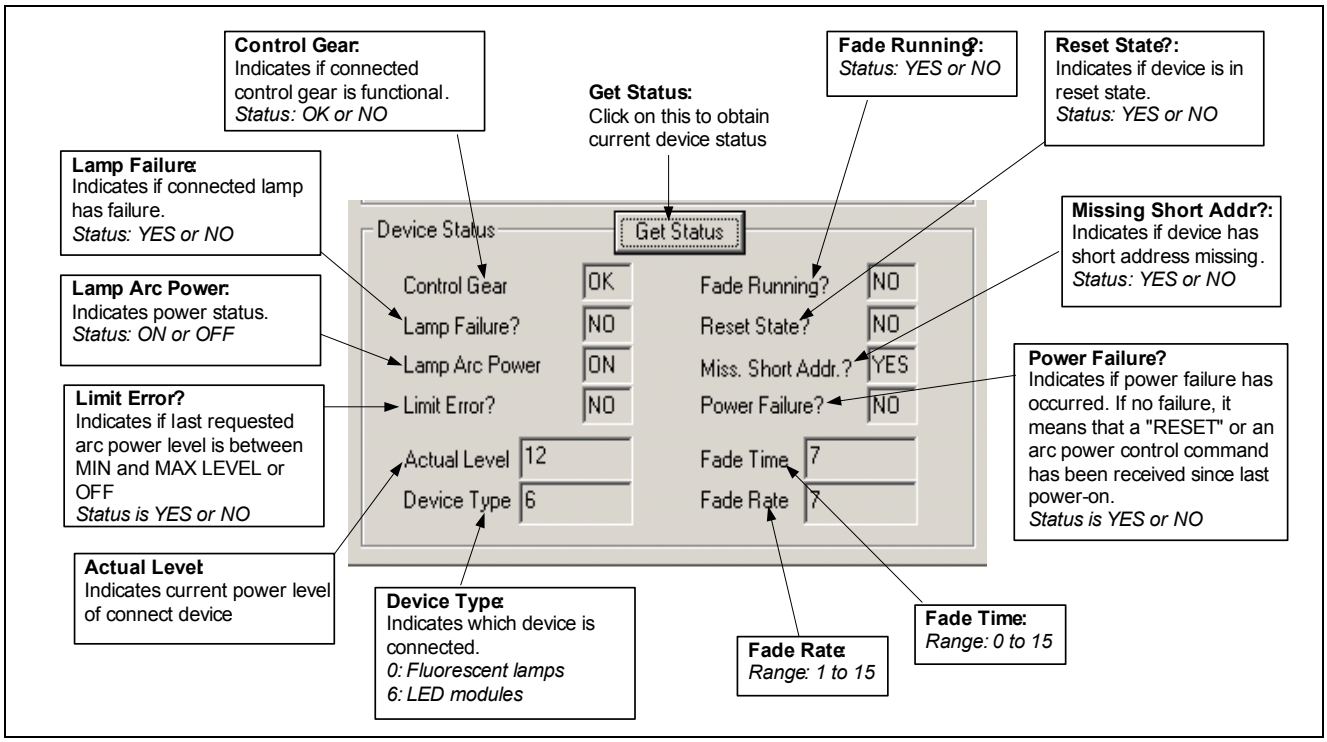

Figure 19 Device Status

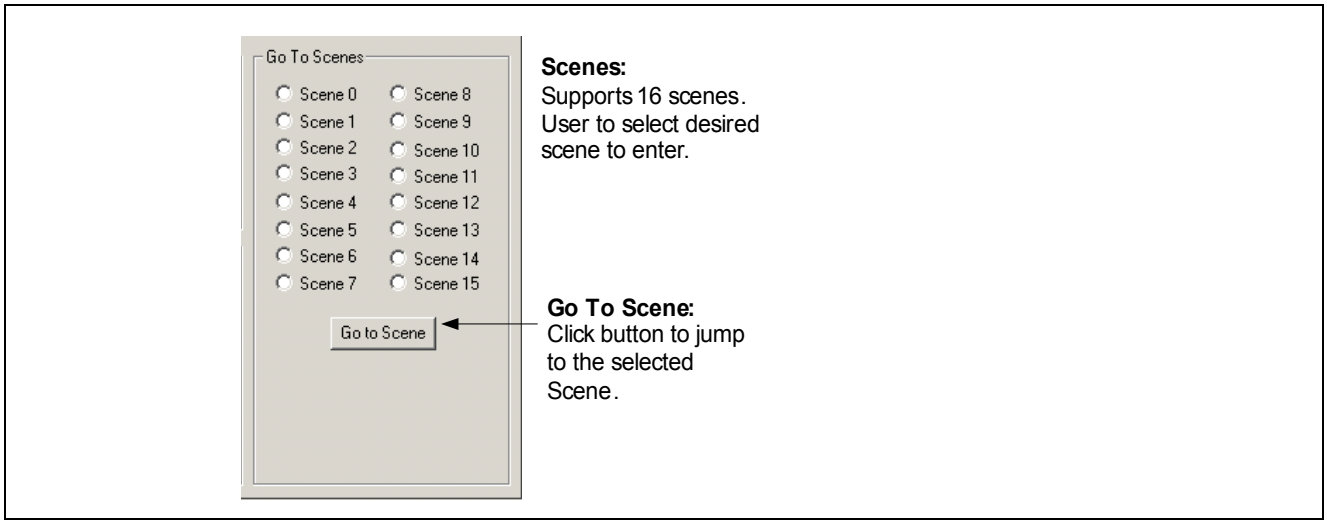

Figure 20 Go to scenes

3.4 Detailed Configuration Command Tab

This section describes the options in the configuration settings.

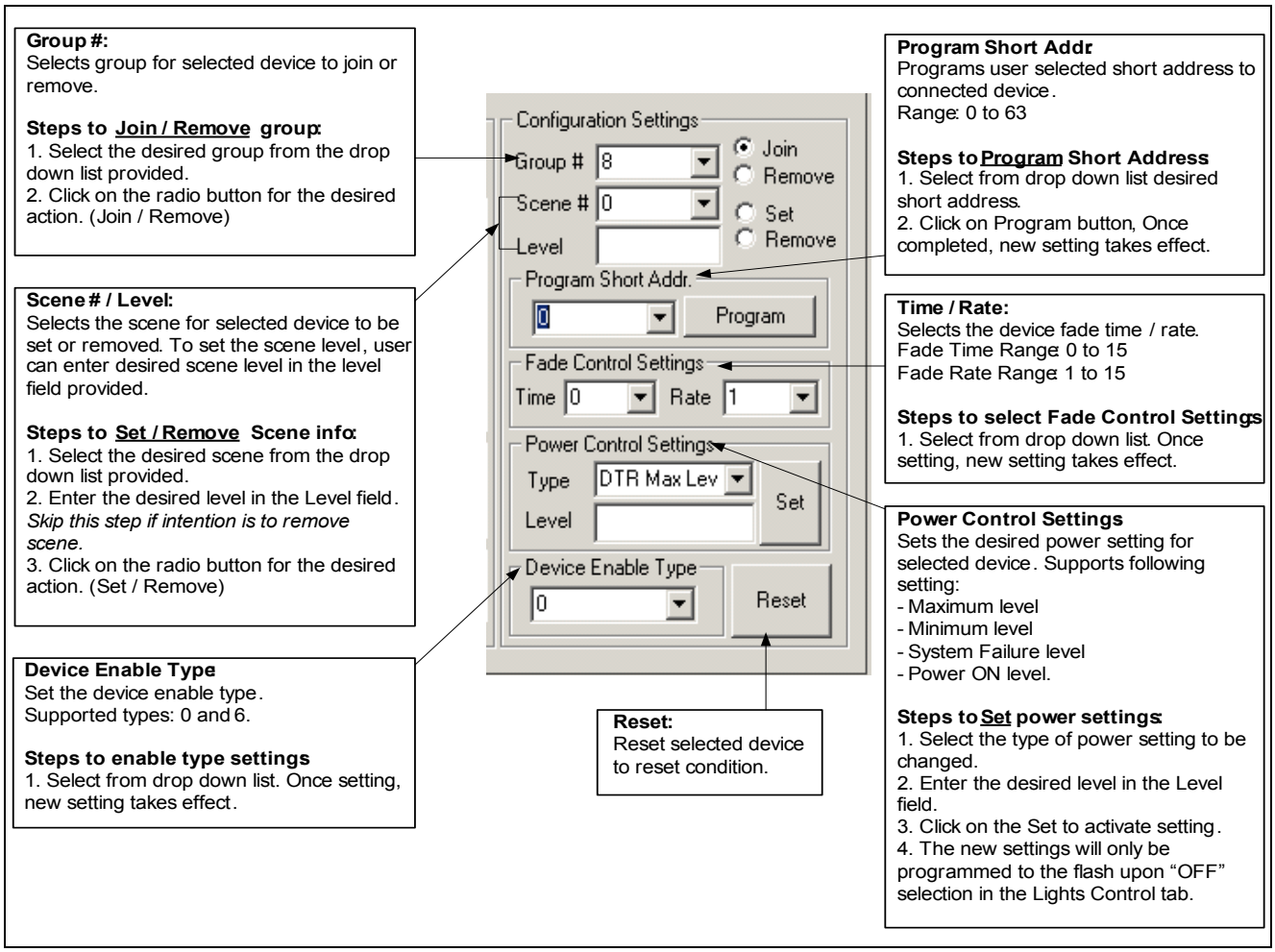
Group #:
Selects group for selected device to join or remove.
Steps to Join / Remove group:
1. Select the desired group from the drop down list provided.
2. Click on the radio button for the desired action. (Join / Remove)
Scene # / Level:
Selects the scene for selected device to be set or removed. To set the scene level, user can enter desired scene level in the level field provided.
Steps to Set / Remove Scene info:
1. Select the desired scene from the drop down list provided.
2. Enter the desired level in the Level field. Skip this step if intention is to remove scene.
3. Click on the radio button for the desired action. (Set / Remove)
Device Enable Type
Set the device enable type.
Supported types: 0 and 6.
Steps to enable type settings
1. Select from drop down list. Once setting, new setting takes effect.
Configuration Settings
Group # 8
Join
Remove
Scene # 0
Set
Remove
Level
Program Short Addr.
0
Program
Fade Control Settings
Time 0
Rate 1
Power Control Settings
Type DTR Max Lev
Set
Level
Device Enable Type
0
Reset
Reset:
Reset selected device to reset condition.
Program Short Addr
Programs user selected short address to connected device.
Range: 0 to 63
Steps to Program Short Address
1. Select from drop down list desired short address.
2. Click on Program button, Once completed, new setting takes effect.
Time / Rate:
Selects the device fade time / rate.
Fade Time Range: 0 to 15
Fade Rate Range: 1 to 15
Steps to select Fade Control Settings
1. Select from drop down list. Once setting, new setting takes effect.
Power Control Settings
Sets the desired power setting for selected device. Supports following setting:
- Maximum level
- Minimum level
- System Failure level
- Power ON level.
Steps to Set power settings:
1. Select the type of power setting to be changed.
2. Enter the desired level in the Level field.
3. Click on the Set to activate setting.
4. The new settings will only be programmed to the flash upon "OFF" selection in the Lights Control tab.

Figure 21 Configuration Settings

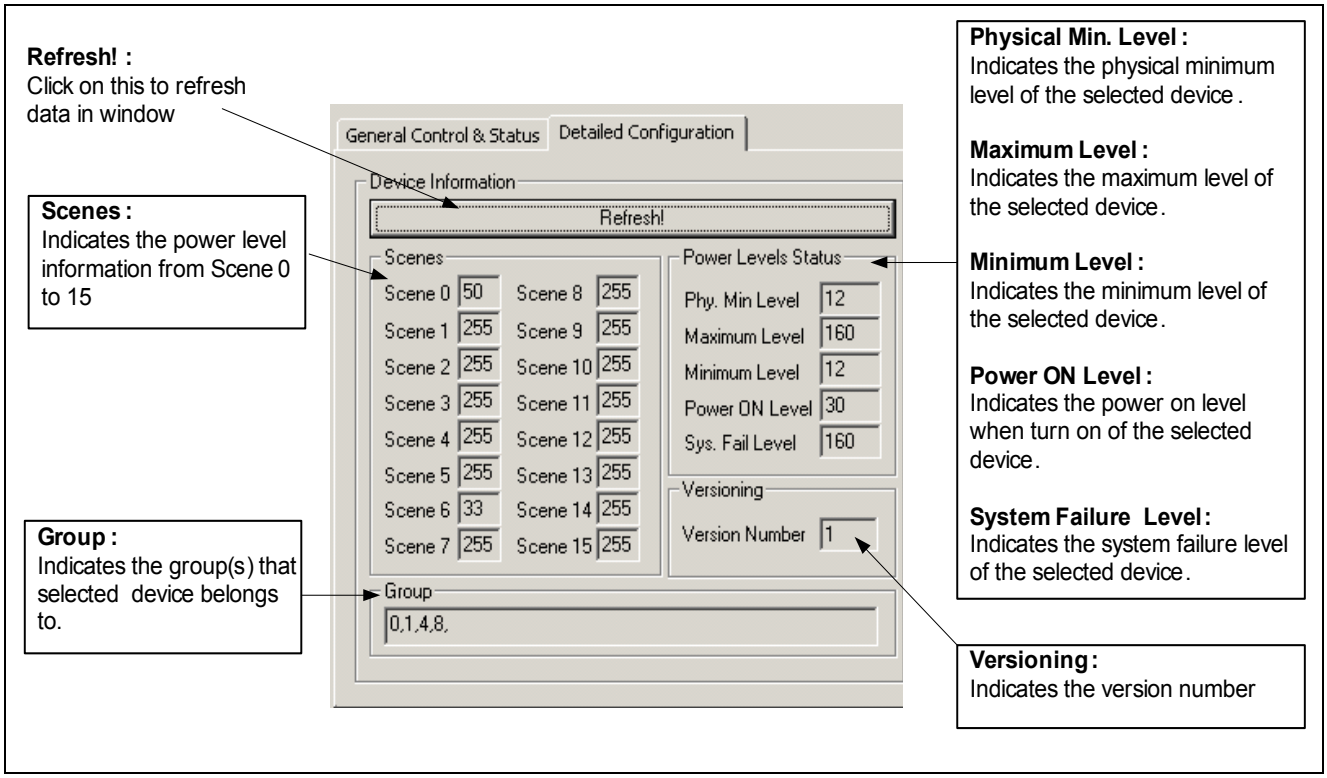

Figure 22 Device Information

4 Connecting to a DALI network

This chapter details an Infineon DALI PHY circuit construction to support device evaluation within a typical DALI network, using the XC822 or XC836 Easy Kit board.

4.1 DALI PHY Board Design

This following figure shows the schematic for a DALI PHY circuit construction that can be used with the XC822 Easy Kit board.

Note: The DALI PHY board design supports a DALI bus level from 14.5V to 22.5V. The values of R1 and R4 can be adjusted to support a wider DALI bus voltage range if required.

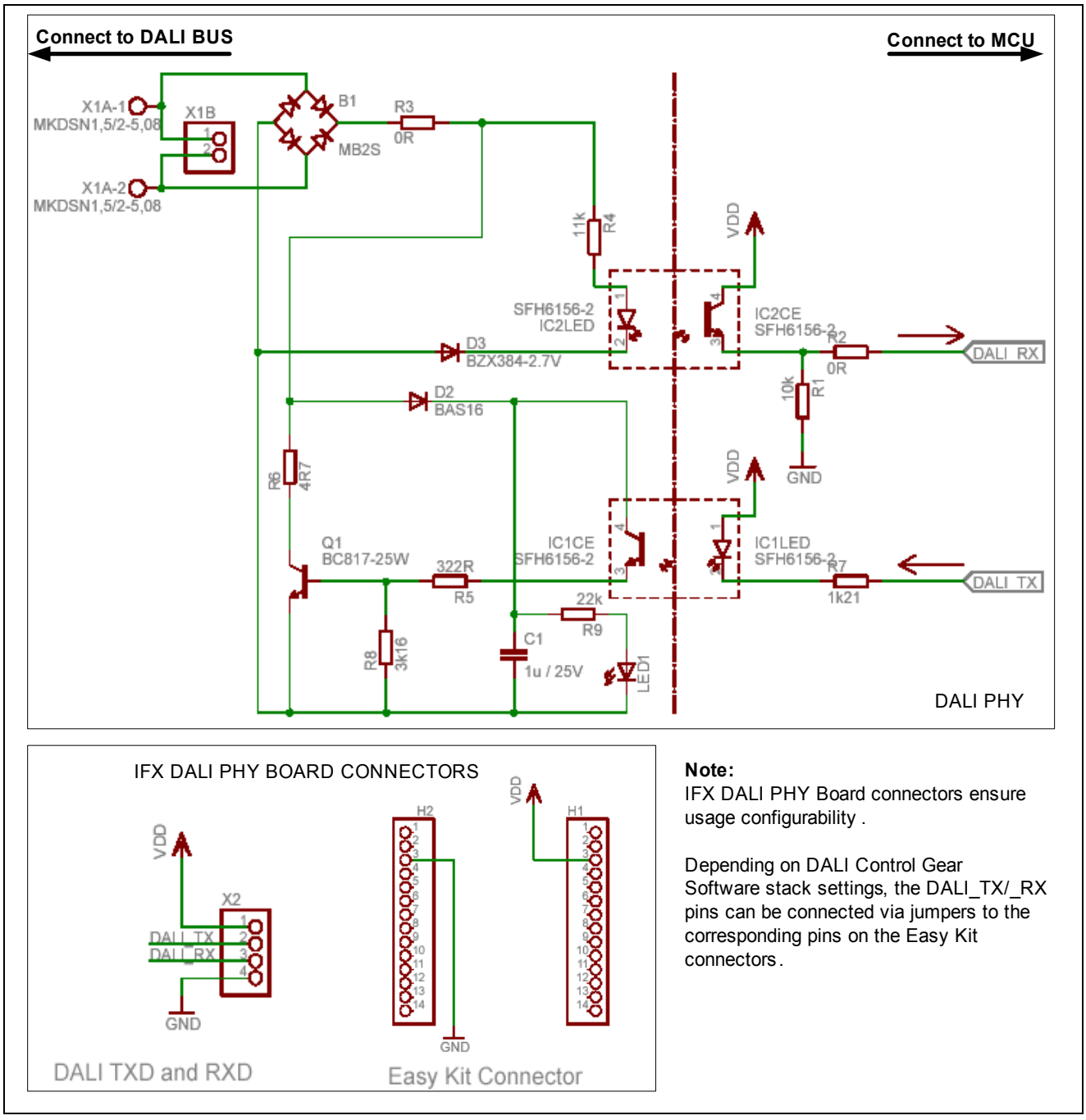

Figure 23 DALI PHY Board Schematics

Table 1 Bill of Material for DALI PHY Circuit

Item	Reference	Value	Device	Package	Description
1	B1	MB2S	MB2S	SOIC-4	Bridge Rectifier
2	C1	1u / 25V	C-EUC1210	C1210	Capacitor
3	D2	BAS16	DIODE-SOD323-R	SOD323-R	Diode
4	D3	BZX384-2V7	DIODE-SOD323-R	SOD323-R	Diode
5	IC1	SFH6156-2	SFH6156	SFH	5.3 kV TRIOS High Reliability Optocoupler
6	IC2	SFH6156-2	SFH6156	SFH	5.3 kV TRIOS High Reliability Optocouplerstor
7	Q1	BC817-25W	BC817-25WSMD323	SOT323	NPN Transistor
8	R1	10R	R-EU-R0603	R0603	Resistor
9	R2	0R	R-EU-R0603	R0603	Resistor
10	R3	0R	R-EU-R0603	R0603	Resistor
11	R4	11k	R-EU-R0603	R0603	Resistor
12	R5	324R	R-EU-R0603	R0603	Resistor
13	R6	4R7	R-EU-R0603	R0603	Resistor
14	R7	1k21	R-EU-R0603	R0603	Resistor
15	R8	3k16	R-EU-R0603	R0603	Resistor
16	X1A	MKDSN1,5/2-5,08	MKDSN1,5/2-5,08	MKDSN1,5/2-5,08	MKDSN 1,5/2-5,08 Printklemme
17	X1B	2x1	PINHD-1X2	1X02	Pin Header
18	X2	4x1	PINHD-1X4	1X04	Pin Header
19	H1	SAMTEC SSQ-1-14-03-S-S	PINHD-1X14	1X14	Pin Header
20	H2	SAMTEC SSQ-1-14-03-S-S	PINHD-1X14	1X14	Pin Header

4.2 DALI PHY Board Settings

To ensure that the DALI signals are correctly received, the pull devices on the selected DALI-RX pin must be disabled. The default selected DALI-RX pin in the DALI Control Gear Software Stack is P1.0. The jumper settings on **Figure 24** can be selected to disable the pull devices on this pin in the XC822 Easy Kit.

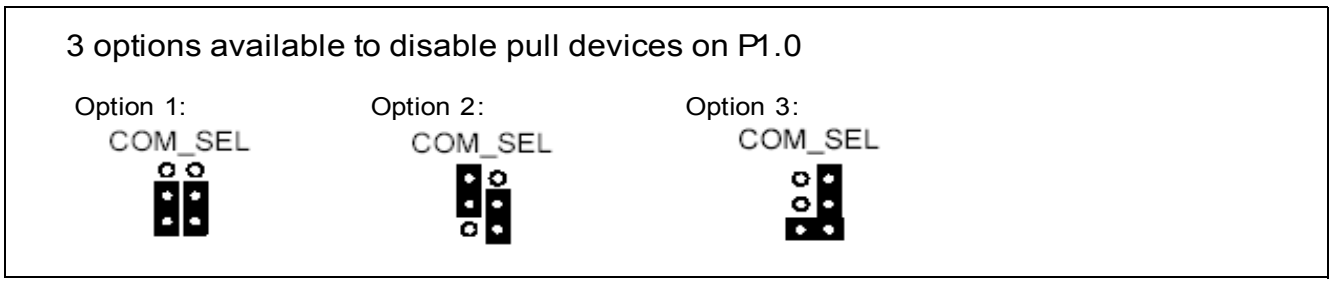

Figure 24 Jumper JP2 COM_SEL settings on XC822 Easy Kit

5 Summary

Infineon's LightNet tool models the function of a lighting control device, controlling DALI control gears. This document has demonstrated how easily the tool can be used to evaluate a DALI system.

6 References

[1] IEC 62386 Digital addressable lighting interface; Part 101: General requirements - System (Edition 1.0, 2009-06)

[2] IEC 62386 Digital addressable lighting interface; Part 102: General requirements - Control gear (Edition 1.0, 2009-06)

[3] AP08102 DALI Control Gear Software Stack

[4] XC82x User Manual 1.1

[5] XC83x User Manual 1.0

[6] Hardware Manual Easy Kit XC822-TSSOP16 board V1.0

[7] Hardware Manual Easy Kit XC836-TSSOP board V1.0

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